

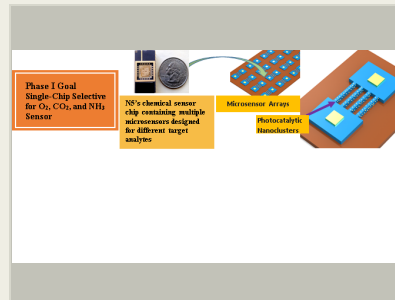
Nanoengineered Hybrid Gas Sensors for Spacesuit Monitoring, Phase I

Completed Technology Project (2015 - 2016)



Project Introduction

Extravehicular Mobility Units (EVU) are the necessary to perform elaborate, dynamic tasks in the biologically harsh conditions of space from International Space Station (ISS) external repairs to human exploration of planetary bodies. The EVUs have stringent requirements on physical and chemical nature of the equipment/components/processes, to ensure safety and health of the individual require proper functioning of its life-support systems. Monitoring the Portable Life Support System (PLSS) of the EVU in real time is to ensure the safety of the astronaut and success of the mission. N5 Sensors will demonstrate an ultra-small form factor, highly reliable, rugged, low-power sensor architecture that is ideally suited for monitoring trace chemicals in spacecraft environment. This will be accomplished by our patent-pending innovation in photo-enabled sensing utilizing a hybrid chemiresistor architecture, which combines the selective adsorption properties of multicomponent (metal-oxide and metal) photocatalytic nanoclusters together with the sensitive transduction capability of sub-micron semiconductor gallium nitride (GaN) photoconductors. For the phase I project we will demonstrate oxygen, carbon dioxide, and ammonia sensor elements on a single chip. Innovative GaN photoconductor design will enable high-sensitivity, low power consumption, and self-calibration for the sensor current drift. The multicomponent nanocluster layer design enables room-temperature sensing with high selectivity, resulting in significant power saving and enhanced reliability. The fabrication of the sensors will be done using traditional photolithography and plasma etching. The nanocluster functionalization layer will be deposited using sputtering methods. The sensor testing will be carried out to determine sensing range, sensitivity, selective, and response/recovery times.



Nanoengineered Hybrid Gas Sensors for Spacesuit Monitoring, Phase I Briefing Chart Image

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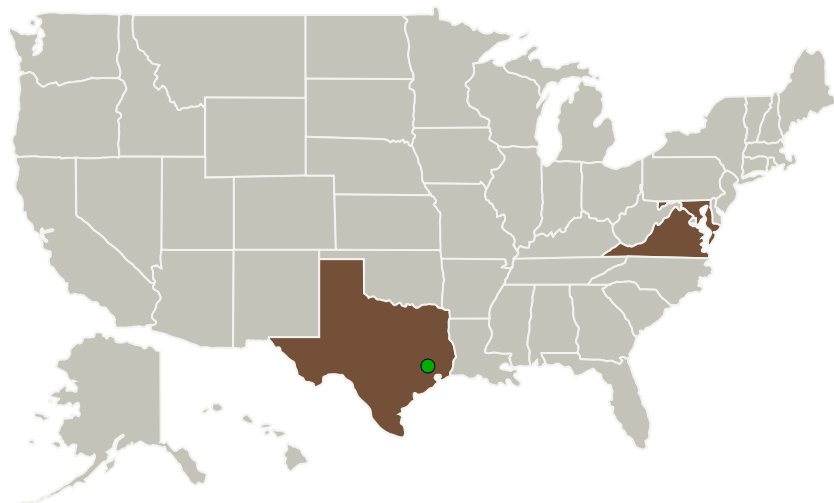
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
N5 Sensors, Inc.	Lead Organization	Industry	Germantown, Maryland
George Mason University	Supporting Organization	Academia	Fairfax, Virginia
● Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Maryland	Texas
Virginia	

Project Transitions

**June 2015:** Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

N5 Sensors, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

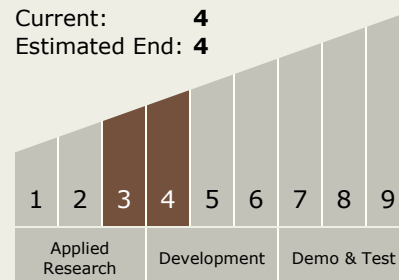
Carlos Torrez

Principal Investigator:

Ratan Debnath

Technology Maturity (TRL)

Start: **3**
 Current: **4**
 Estimated End: **4**



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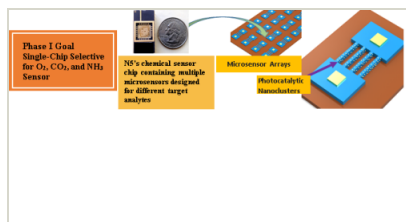


✓ **June 2016:** Closed out

Closeout Documentation:

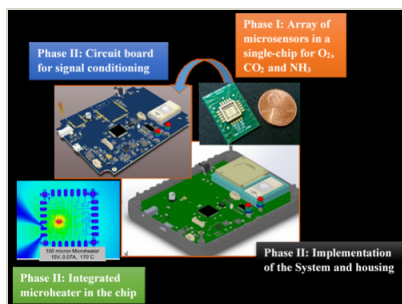
- Final Summary Chart(<https://techport.nasa.gov/file/139271>)

Images



Briefing Chart Image

Nanoengineered Hybrid Gas Sensors for Spacesuit Monitoring, Phase I Briefing Chart Image (<https://techport.nasa.gov/image/132332>)



Final Summary Chart Image

Nanoengineered Hybrid Gas Sensors for Spacesuit Monitoring, Phase I Project Image (<https://techport.nasa.gov/image/126250>)

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.2 Extravehicular Activity Systems
 - └ TX06.2.2 Portable Life Support System

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System